

## Standard Manufacturing Process and Validation of Roudra Rasa- A Rasausadhi Mentioned For Arbuda in Ayurveda

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### ABSTRACT

The one of the oldest system of medicine, Ayurveda is momentous in audience of worldwide by virtue of its holistic approach of life. Techniques used in Rasa Shastra like shodhana, marana, bhavana acclimatize the toxic principles into effective remedies known as herbo mineral formulations (Rasaoushadhies) in Ayurveda. Roudra rasa is a herbo mineral formulation which has been indicated to treat arbuda. Arbuda is the Sanskrit word used for tumor. According to Sushruta the three doshas (Vata, Pitta and Kapha) when aggravated, may develop a tumor; especially aggravated Kapha and Vata doshas. This affects the tissue, which might result in developing a malignant tumor. The basic material used to prepare Roudra rasa is kajjali followed by sequential bhavana (levigation) of herbal drugs. Since the poly herbo mineral formulation is heat sensitive, laghu puta is mentioned for its marana. The technique of giving bhavana to metallic or mineral preparation lies in the fact that to bring minute particles of the material in contact with the liquid media, transformation of the coarse powder to a finer state, impregnation of the properties of the media into the material so as to establish stable, unique physico-chemical changes i.e. introduction of trace elements from the herbal juices to potentiate its efficacy and further facilitate the process of marana. Two different samples of Roudra rasa have been prepared, one of which involves Hinguluttha parada, considered as the most superior as per classical literature and a complete SOP of the formulations has been validated. Moreover validation of SOP can never be free from precautionary measures. The technique of bhavana in generally leads to an increase in weight provided it is done under suitable climatic conditions to facilitate the process of drying. Thus considering the industrial aspect of the formulation loss of sample during the process of bhavana should be optimized by using technical instruments

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required for producing large batches of medicines as loss of sample during the process of bhavana can be a commonest problem. Arbuda is a sensitive disease, thus a comparative study of Roudra rasa is coupled up with complete process standardization. Since the formulation involves the use of various herbal drugs, isolating its chemical and structural entity is of a great concern. Infra Red Spectroscopy of the two formulations gave a preliminary outlook in the difference of the functional groups and long chain bands present in the formulations and at the same time shows that the formulations are devoid of any organic compounds and thus its consumption is very much safe. Ayurvedic classical standardization parameters for bhasma that were carried out revealed the complete compliance of the Roudra rasa prepared by using hinguluttha parada as well as without using hinguluttha parada. In terms of processing Roudra rasa prepared by using hinguluttha parada was more stable in consistency. Classical evidences and literature holds a firm stand in the modern era and updating Ayurveda by integrating with modern technologies, without changing the basic principles is a challenging task and it should be taken into serious concern in the modern times so that the heritage of Ayurveda should not get lost by the curtains of modern herbalist research.

### Keywords:

*Roudra rasa, Poly herbo mineral, Hinguluttha parada, Infra Red Spectroscopy.*

## INTRODUCTION

Ayurveda is the science of life practiced by ancient Aryans which is based on Atharvaveda, one of the oldest scriptures of Hindus. The object of Ayurveda is to counteract the imbalance of three very essential elements, Vata, Pitta, and Kapha which constitutes the tridosha which regularizes the normal working of the human body.<sup>[65]</sup>

Rasashastra as a branch of Ayurveda which deals with knowledge of alchemical and pharmaceutical processes viz. Astadasa samaskaras of mercury and Shodhana, Jarana, Marana etc. processes of different metallic, mineral, calcium substances of aquatic and soil origin and poisonous herbal substances and therapeutic parameters of Rasausadhi viz. dose, duration, indication and contraindication. Rasashastra is an integral part of Ayurveda which was evolved from remote antiquity. Mythologically Lord Shiva is considered as the pioneer of this branch of science.<sup>[66]</sup>

Ayurvedic compound formulation is mainly divided into two categories: Rasausadhi

(predominantly metals and minerals are used for preparation and dealt in Rasashastra), Kastausadhi (predominantly plant drugs are used for preparation and mainly dealt in Bhaisajya Kalpana).<sup>[61]</sup> Among these the Rasausadhi showed much more therapeutic efficacy because of their smaller dosage, palatability, fast action and due to lesser time of administration. Human being has always wanted to know the unknown and to see the unseen. Rasashastra is such a unique branch of science which deals with the various methods for utilizing metals and minerals along with effective herbal drugs for the benefit of mankind to yield therapeutic benefits. More aptly, Rasashastra can be described as Ayurvedic pharmaceutics, which deals with the drugs of mineral origin, their varieties, characteristics, processing techniques, properties and their therapeutic uses. There are two main categories of Rasashastra - Alchemy and Rasayana. While Alchemy is involved in turning mercury into gold, Rasayana, on the other hand, helps in the rejuvenation of the mind and body. This science is often referred to as 'alchemy' and the resultant medications are called rasas, which mainly comprise of metallic ashes called bhasma. Bhasma act as catalysts and

increase the bioavailability of the herbs to the cell. After performing the desired action, bhasma are eliminated through our excretory systems, specifically via mutra and mala (urine and stool). Ayurvedic chemists have evolved various procedures like sublimation, oven treatment, controlled heat incineration, grinding, mixing, churning, and so on, to inculcate the therapeutic properties in the minerals, for which many specific types of yantras (instruments) are designed. When it comes to using any metal, mineral or a natural product directly or as a formulation, the alchemic scientists (Raja siddhas) state that, barring a few exceptions, everything should be first purified/detoxified (Shodhana) and then must be converted into bhasma (ash). This is achieved by controlled/sustained heat incineration again and again.<sup>[62]</sup>

Roudra rasa is a novel herbo-mineral preparation of Ayurveda mentioned to treat arbuda. The preparation of Roudra rasa involves two major steps: preparation of kajjali by using Parada and Gandhaka. Now these chief ingredients are given the bhavana of specific herbal juice and decoctions as mentioned in the classics and the second step involves, subjecting it to specific quantum of heat (puta). To prepare Roudra

rasa laghu puta is mentioned.<sup>[2]</sup> The formulation of Roudra rasa is been indicated in the treatment of arbuda. Arbuda is a versatile term. In this perspective it represents a swelling, tumor a long round mass, lump of flesh with rough surface, frequent bloodletting etc. The terminology Arbuda is synonymous which may also be explained as reflection of uncontrolled numerous multiplication of cells. According to Acharya Sushruta, the aggravated doshas causes vitiation of mamsa, produces muscular swelling anywhere in the body which is round, static with mild pain, big size, broad base, growing slowly and not ripening. This is known as arbuda.

## LITERATURE REVIEW

### ROUDRA RASA

It is a formulation which is told under Arbudaadikara. There are seven references available for this preparation. The classical references found about Roudra rasa are as follows:

- a) Bhaisajya Ratnavalli, pg no 583, shloka no 44/59-60<sup>[2]</sup>
- b) Rasaratna Samucchaya, pg no 576, shloka no 1-2<sup>[3]</sup>
- c) Rasendra chintamani, pg no 342, shloka no 1-2<sup>[4]</sup>

- d) Rasamritam, pg no 127, shloka no 320-321<sup>[5]</sup>
- e) Bharata Bhaisajya Ratnakara pg no 455(6161)<sup>[6]</sup>
- f) Basavarajiyam, pg 326<sup>[7]</sup>
- g) Dhanwantari, pg no138, chapter 80<sup>[8]</sup>

### MASTER FORMULA FOR ROUDRA RASA AS PER B.R.

SL. NO	INGREDIENT	QUANTITY	FORM	CHEMICAL/BOTANICAL NAME
1	Parada	1 part	Shuddha	Hydrargium
2	Gandhaka	1 part	Shuddha	Sulphur
3	Nagavalli patra	Q.S.	Swaras	Piper betel
4	Meghananda panchang	Q.S.	Kwath	Amaranthus spinosus
5	Punarnava panchang	Q.S.	Swaras	Boerhaavia diffusa
6	Gomutra	Q.S.	Liquid	Bos Taurus
7	Pippali phala	Q.S.	Kashaya	Piper longum

Shuddha parada and shuddha gandhaka should be taken and kajjali is prepared until kajjali siddhilakshanas are obtained. Bhavana of kajjali is given with the above mentioned herbal drugs in sequential order. Thereafter chakrika are prepared and put inside Sharava. After sandibandana it is given laghu puta. The dose of this formulation is given as 125 mg, anupana is said to be madhu and main indication is given for arbuda. In majority of the references the ingredients are the same only in Basavarajiyam, Bala is told as an additional drug for bhavana, all other ingredients are the same. In parishista of

Rasa Yoga Sagara<sup>[1]</sup> there is a preparation in the name of Roudra rasa indicated for sannipatha jwara. Here the ingredients are different.

### ANALYSIS AND DISCUSSIONS

#### STANDARD MANUFACTURING PROCESS AND EXPERIMENTAL WORK

#### PHARMACEUTICAL WORK

*To do gandhaka shodhana*<sup>[55]</sup>

**Date Start** 17/08/2012 : **End Date**

17/08/2012

**Time (start)** 4.00 PM : **Time (stop)** 4.30 PM

**Total time consumed** 30 minutes

### **INGREDIENTS TAKEN**

Bhringaraja plant taken (Fresh)=3.7 kg  
 Bhringaraja swaras obtained =1.5 lts  
 Go-ghrita = 20 g  
 Gandhaka = 500 g

### **APPARATUS TAKEN**

Khalva yantra (mortar and pestle)  
 Tula yantra (weighing device)  
 Vastra (mouscine cloth)  
 Ghata (vessel)  
 Chullika (heating device)

### **PROCEDURE**

For the purification of Gandhaka dhalana process was used.

*To do hingula shodhana* [56]

<b>Date Start</b>	5/10/12	<b>:End Date</b>
	5/10/12	
<b>Time (start)</b>	10.00 AM	<b>:Time (stop)</b>
	2.00 PM	
<b>Total time consumed</b>	4.00 hrs	

### **INGREDIENTS TAKEN**

Hingula (Raw form)  
 =250 g

Quantity of Nimbu taken

=250 g

Quantity of Nimbu swaras obtained

=160 ml

### **APPARATUS TAKEN**

Khalva yantra (mortar and pestle)  
 Tula yantra (weighing device)  
 Vastra (mouscine cloth)  
 Spatula  
 Knife  
 Beaker  
 Measuring cylinder  
 Imam Dasta

### **PROCEDURE**

In order to purify and make hingula devoid of blemishes, it is subjected to bhavana of nimbu swaras and triturated until the liquid is dried. Hingula in raw form was taken, weighed and pounded in imam dasta. Nimbu was taken and weighed, cut into halves and then swaras was extracted from it. It was measured in measuring cylinder and poured in khalva yantra and was triturated until the total drying of the liquid. Spatula was used in order to avoid adherence.

### **OBSERVATION**

It was purified and attained beautiful red colour and looks like best kind of Kesara.

*To extract Hinguluththa parada*<sup>[79]</sup>

**Date Start** 8.10.12    :**End Date**

8.10.12

**Time (Start)** 9.30 AM: **Time (stop)**

4.30 PM

**Total time consumed** 6.00 hrs

#### APPARATUS TAKEN

Damaru yantra

Vastra (mouscine cloth)

Kaparmitti (mud smeared cloth)

Thermometer

Chullika (heating device)

Spatula

Tula yantra (weighing device)

Scraper

Ghata (vessels)

#### PROCEDURE

A vessel is taken and its outer convex bottom a water container is built. Another vessel, the mouth of which is smaller than that of the first vessel is taken and filled with shodhita hingula. Upon this vessel the bigger vessel is placed inverted so that the mouth of the lower vessel

is entered into the mouth of the upper vessel. The joining parts are sealed with mud smeared cloth. After drying the apparatus is placed on stove for heating and the water is replaced at regular intervals with cool water. The temperature of the cool water is suggested to be 20°C.

#### OBSERVATION

Gandhaka was evaporated and black particles were seen to be deposited at the junction of two vessels. Shiny particles of mercury were seen to be deposited on the inner side of the upper vessel which was collected by scraping it off and with subsequent washings with water and weighed before preserving it in well closed container.

#### PRECAUTIONS

1. Hingula obtained from the market should be screened for grahya and agrahya lakshanas.
2. The hingula should be analyzed to verify the % of mercury that is present in it.
3. Temperature of the water is suggested to be maintained at 20°C which can be achieved by replacing

the water with cool water at regular intervals.

4. Mercury deposited on the inner side of the vessel should be carefully scraped with subsequent washings with water, so that pure mercury can be collected.
5. Throughout the process mercury vapours and vapours of sulphur dioxide gas should be prevented.
6. Throughout the process madhyam agni should be maintained.<sup>[80]</sup>
7. The mercury should be allowed to settle down properly so that it can easily be collected.
8. The kaparmitti between the two vessels should be done properly to avoid penetration of moisture or atmospheric gases.

*To prepare Kajjali* <sup>[54]</sup>

**Date (start)** 12/07/12

**End Date** 8/10/12

**Time (start)** 4 hours each day

**Total time consumed** 75 hours

#### INGREDIENTS TAKEN

Shuddha parada 35 g

Shuddha gandhaka 35 g

#### APPARATUS TAKEN

Khalva yantra (mortar and pestle)

Tula yantra (weighing device)

Spatula

#### PROCEDURE

Equal quantity of shuddha parada and equal quantity of shuddha gandhaka is taken and triturated in khalva yantra until kajjali siddhilakshanas are obtained. The shodhana process of parada was carried out according to Rasa Tarangini, Panchamtarang, shloka no 27-30. <sup>[81]</sup> as specified by the pharmaceutical firm. Spatula was used in subsequent stages of mardana to avoid adherence.

#### TESTS

The final product is tested for the presence of any lustre by rubbing the product on the palm with a finger preferably after adding water. No free mercury particles were present as they were not shinning under sunrays. The prepared kajjali is black as collyrium or smoke.

#### SHOWING THE DIFFERENT RESULTS OF BHAVANA

Sample 1: Kajjali prepared without using Hinguluttha parada

Sample 2: Kajjali prepared with Hinguluttha parada

SL. NO.	Bhavana dravyas used	Form of bhavana dravyas used	Quantity of bhavana dravyas used	Weight of Kajjali before bhavana		Weight of Kajjali after bhavana	
				Sample 1	Sample 2	Sample 1	Sample 2
1.	Nagavalli patra	Swaras	25 ml	45.16 g	39.12 g	45.83 g	39.86 g
2.	Meghananda panchang	Swaras	25 ml	45.83 g	39.86 g	45.58 g	39.97 g
3.	Punarnava panchang	Swaras	25 ml	45.58 g	39.97 g	45.92 g	40.12 g
4.	Gomutra	Fresh	10 ml	45.92 g	40.12 g	45.75 g	40.86 g
5.	Pippali phala	Phanta	10 ml	45.75	40.86 g	45.92 g	41.11 g

**To do Puta Karma (Sample 1 and Sample 2)** [83]

**INSTRUMENT:** Electric Muffle Furnace

Sample 1: Kajjali prepared with Hinguluttha parada

Sample 2: Kajjali prepared with parada

Number of puta given: 4

SL. NO.	TEMPERATURE	DURATION
1.	(50-100) <sup>0</sup> C	5 min
2.	(100-150) <sup>0</sup> C	10 min
3.	(150-200) <sup>0</sup> C	15 min
4.	(200-250) <sup>0</sup> C	20 min
5.	(250-300) <sup>0</sup> C	25 min
6.	(300-350) <sup>0</sup> C	30 min
7.	(400-450) <sup>0</sup> C	35 min
8.	(450-500) <sup>0</sup> C	40 min
9.	500 <sup>0</sup> C	4 hours

## OBSERVATION

**TEMPERATURE PATTERN IN MUFFLE FURNACE**

Bhasma of both the samples were prepared. Sample 1 showed a light

reddish brown colour, while sample 2 showed a deep reddish colour.

### **ANALYTICAL WORK**

*To do Bhasma Pariksha* [82]

#### **TABLE NO 3.2.1 SHOWING THE RESULTS FOR BHASMA PARIKSHA**

Sample 1: Roudra rasa prepared with Hinguluttha parada

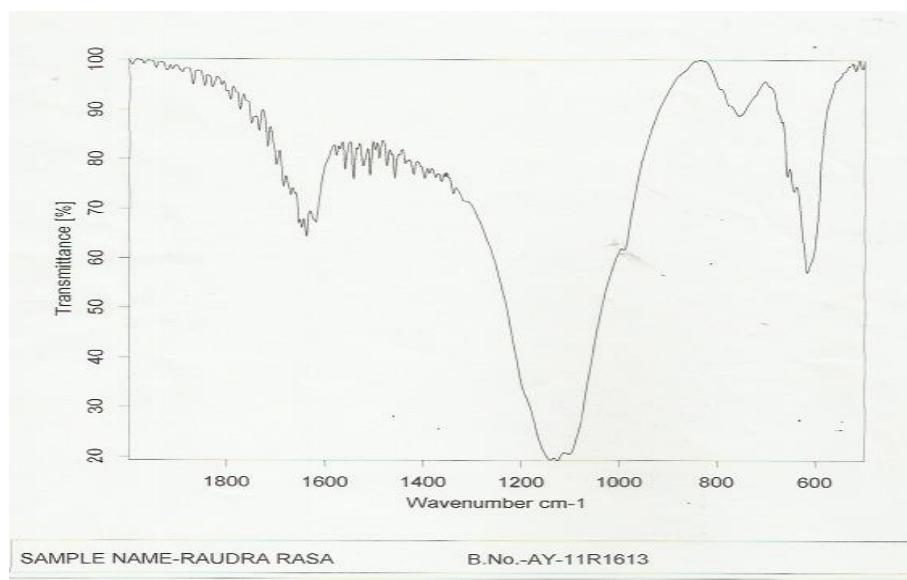
Sample 2: Roudra rasa prepared with Parada

<b>SL.NO</b>	<b>Name of Test</b>	<b>Observation</b>	<b>Result</b>	
			<b>(Sample 1)</b>	<b>(Sample 2)</b>
1.	Varitara	The bhasma was found floating in the water partially.	Complied	Complied
2.	Rekhapurna	The bhasma was found within the minute lines of the index and the thumb finger.	Complied	Complied
3.	Uttama	A rice grain when kept over the formulation was found floating like a swan on a lake.	Complied	Complied
4.	Nishchandrika	No shining particle was present.	Complied	Complied
5.	Niswadu	The bhasma was tasteless.	Complied	Complied
6.	Nirdhuma	Finished bhasma will not emit any smoke when put over fire, while the impure form emits smoke.	Complied	Complied
7.	Amla	When bhasma is put with citrus juice it should retain its colour and form.	Complied	Complied

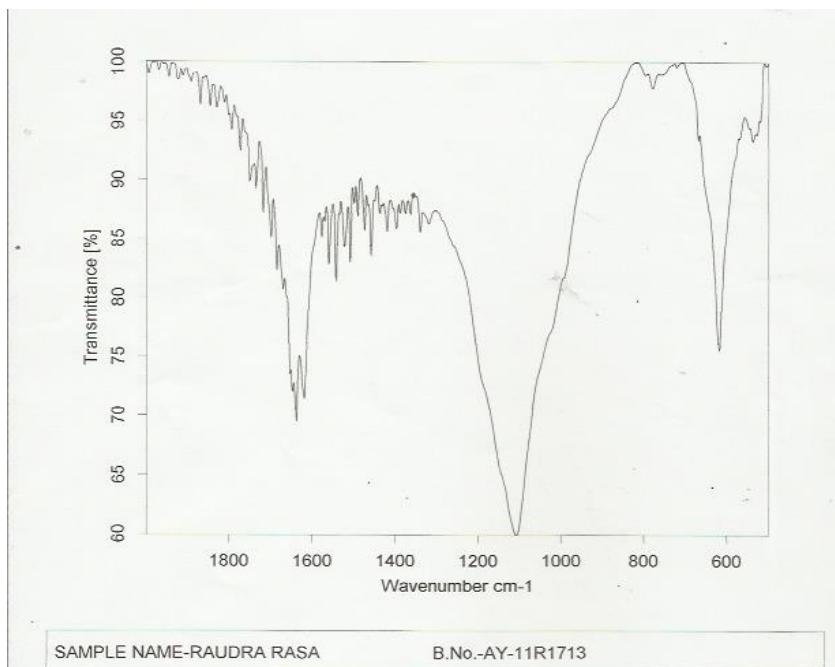
*To perform IR of both the formulations (From, International Testing Centre, Panchkola, Haryana) [84]*

**Date of Testing** 11.03.2013

**A) SAMPLE CODE: AY-11R1613 (Roudra rasa prepared with hinguluttha parada)**



**B) SAMPLE CODE: AY 11R1713 (Roudra rasa prepared with parada)**



All the ingredients that were necessary for preparing Roudra rasa were authenticated from Ayush Certified Laboratory, Belgaum (Central Research Facility). The % of S in raw gandhaka has been found out to be

85.88% and the same in shuddha gandhaka has been found out to be 87.30% (Bangalore Test House) which reveals that the shodhana process impregnates sandriya qualities in the drugs as described in Ayurveda. The weight

of hingula before bhavana process was found to be 210 g and after bhavana process it was found to be 215 g. The quantity of parada obtained from 215 g hingula was 40 g. 70 g of kajjali with parada, and 40 g of kajjali prepared with hinguluttha parada was prepared and the Ayurvedic classical parameters were tested. Both kajjali complied with the kajjali siddhilakshanas. For the puta karma electric muffle furnace was used and the temperature was maintained at  $500^{\circ}\text{C}$ . After the completion of puta karma for both the samples the Ayurvedic classical parameters for testing bhasma were carried out which revealed that both the samples complied with the classical parameters. The Infra Red Spectroscopy was carried out for both the formulations of Roudra rasa using KBr pellet method (International Testing Centre, Panchkola, Haryana). The IR spectra of both the samples states that the major vibration frequency peaks of both the samples are matching as they lie within the same frequency region. Hence it can be concluded that same compound have been extracted and prepared in both the cases and there was no presence of any organic compounds. Nearly 400 g of gandhaka has been preserved and can be returned to the

laboratory if future studies are intended. Roudra rasa is also preserved in well closed container and can be submitted to the laboratory for experimental works in the future.

## CONCLUSIONS AND RECOMMENDATIONS

Roudra rasa is a novel herbo mineral preparation mentioned to treat arbuda. It is prepared by giving bhavana of specific herbs in a sequential manner. In the present study Roudra rasa has been prepared by using two different samples of kajjali, one of which includes hinguluttha parada which is considered as most superior as per classical texts. A complete SOP of the formulation has been prepared so that its manufacturing process can be validated and as well as instrumental analysis has been performed, i.e. Infra red spectroscopy to infer the absence of organic compounds to establish the safety of the formulation and to assess the vibrational ranges and frequencies between the two formulations to validate a comparative study. Modern technology for giving puta has been applied and developed by using electric muffle furnace and a temperature of  $500^{\circ}\text{C}$  has been used to

prepare the bhasma. The process of bhavana leading to the increase in weight has been documented and the precautions required to optimize process standardization has also been mentioned wherever necessary. The Ayurvedic classical parameters for testing bhasma was applied and it was inferred that both the samples complied with the tests that were performed but during the process standardization the consistency of the kajjali prepared with hinguluttha parada was way much smoother than the kajjali that was prepared using parada. The bhasma prepared from the kajjali with hinguluttha parada showed light reddish brown tinge while the bhasma prepared from of kajjali using parada showed a deep reddish tinge .The reason behind the variation of weights after bhavana is due to the fact that some of the kajjali remained attached to the mortar and recovery of that sample was very tedious (in case of gomutra and very less in case of bhavana with meghananda). The reason may be attributed to the highly viscous nature of gomutra coupled up with, particular climatic conditions led to the reduced production of

heat needed to dry the liquid and thus substantial amount of kajjali remain adhered to the mortar and the latter may be attributed due to the processing of the formulation in the mortar pestle. In case of Roudra rasa prepared by with hinguluttha parada, such problems were less encountered which may be due to the superiority of hinguluttha parada which gave the formulation a smooth consistency and thus less amount of sample was lost during manufacturing process and a constant increase in weight was obtained after each bhavana. From the Infra-Red Spectroscopy of both the samples it is concluded that the samples were devoid of any organic compounds and it represents the use of various ingredients with presence of long chain bands and a wide range of functional groups. Thus both the formulations can be recommended for medicinal usage but according to Ayurvedic classical literature and processing techniques the formulation prepared by using hinguluttha parada may be of better quality of medicine that can be recommended in curing arbuda.

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